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Development of bipolar prosthecae by candidate phylum Acetothermia bacteria

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Background

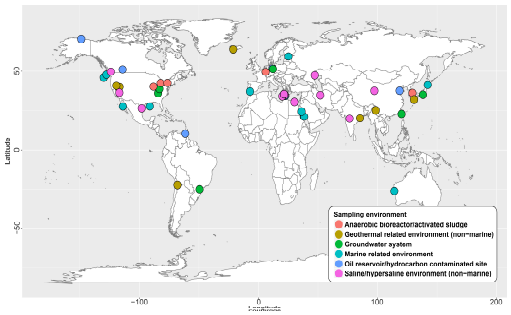
Bacteria from the candidate phylum Acetothermia (OP1) are globally dispersed and occupy many diverse habitats (see figure to the right). However, little is known about their physiology and ecology. We previously observed that Acetothermia bacteria were the most abundant bacteria in the metagenome from an anaerobic digester.

Aim

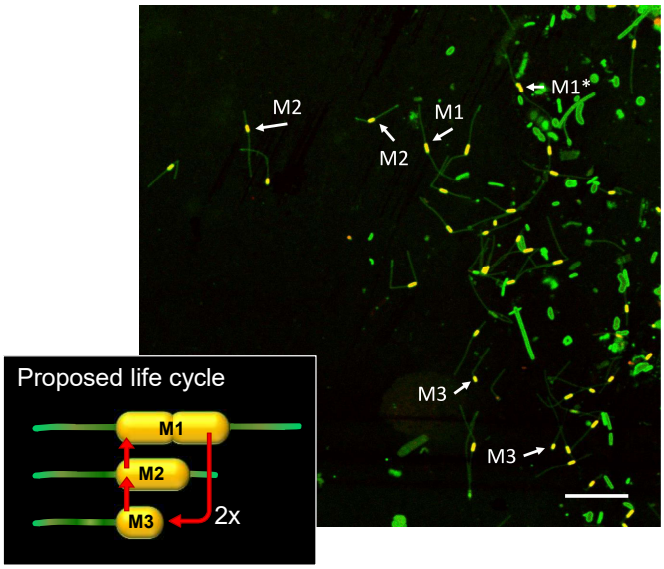
To learn more about their abundance, morphology, and physiological and ecological function.

Conclusions

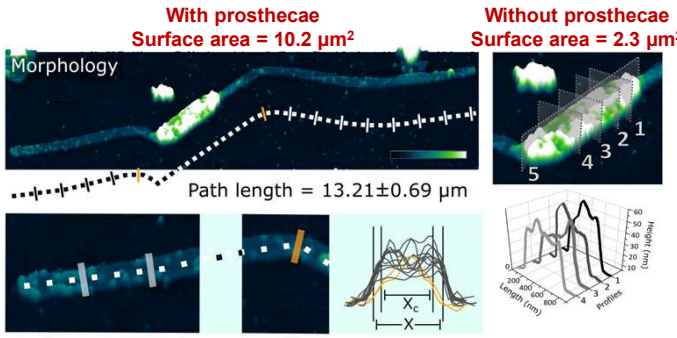
- Specific FISH probes were designed and used to study the Acetothermia bacterium *in situ*.
- The morphology was unusual and composed of a central rod-shaped cell with bipolar prosthecae.
- This may allow for increased nutrient uptake at low concentrations by greatly expanding the cell surface area.
- We obtained the first closed genome from the candidate phylum Acetothermia.
- Genome annotation suggests an anaerobic chemoheterotrophic lifestyle.



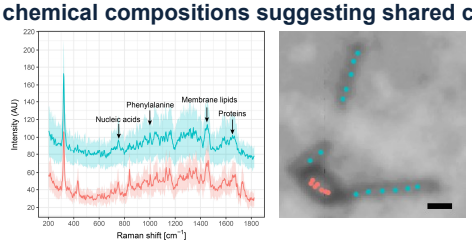
FISH combined with Syto9 staining reveal an unusual morphology composed of a central rod-shaped cell with bipolar prosthecae



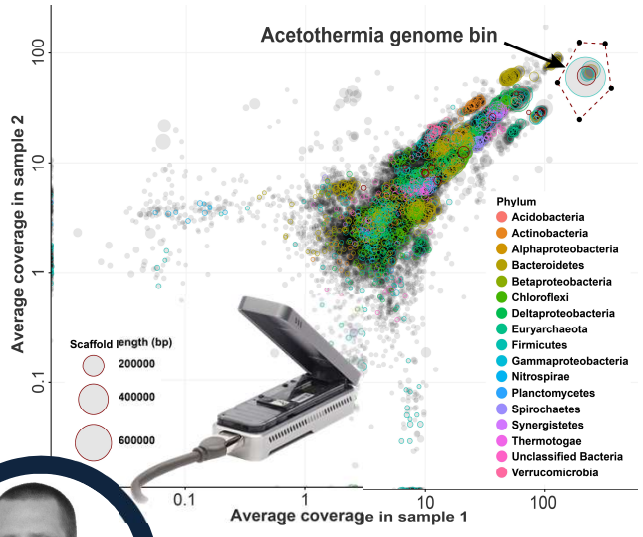
AFM shows that prosthecae greatly expand the cell surface area



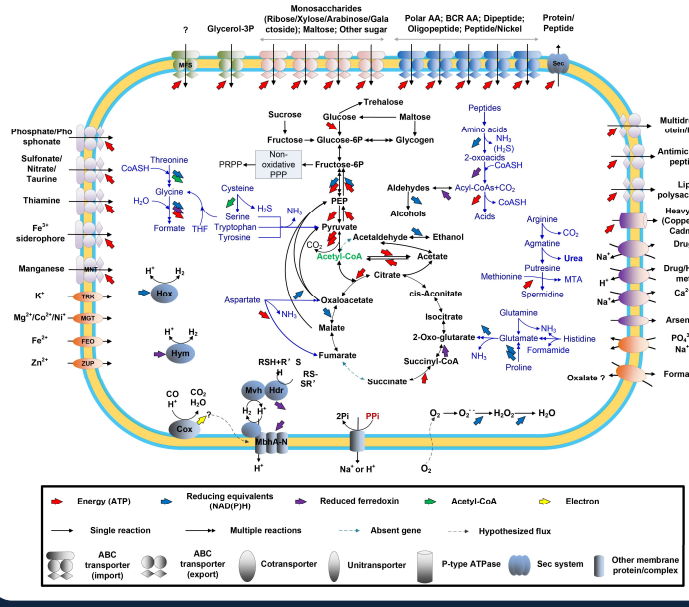
Raman spectra of the prosthecae and central rod cell showed similar chemical compositions suggesting shared cytoplasm



The first closed genome from the candidate phylum Acetothermia was made by genome binning and scaffolding with Nanopore data



Genome annotation and metabolic reconstruction suggested an anaerobic chemoheterotrophic lifestyle



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